NORTHROP GRUMMAN

DEFINING THE FUTURE

The BQM-74F

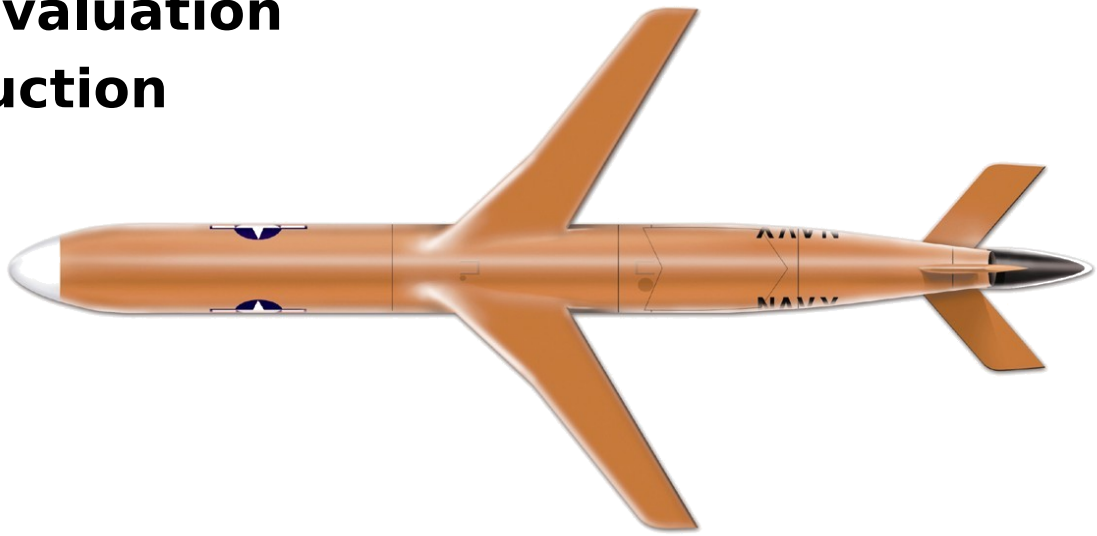
Tomorrow's Target Today

Bill Waldon
BQM-74F Program Manager
Northrop Grumman Unmanned Systems

BQM-74F Tomorrow's Target Today

- Historical Overview
- BQM-74F Capabilities
- System Design and Development Program Status
- System Test and Evaluation
- Planning for Production

Dimensions	
Wing Span	84 in
Wing Area	8 ft²
Fuselage Length	180 in
Fuselage Diameter	14 in
Nominal Weights	
Launch	732 lb
Gross Flight	620 lb
Useable Fuel	172 lb



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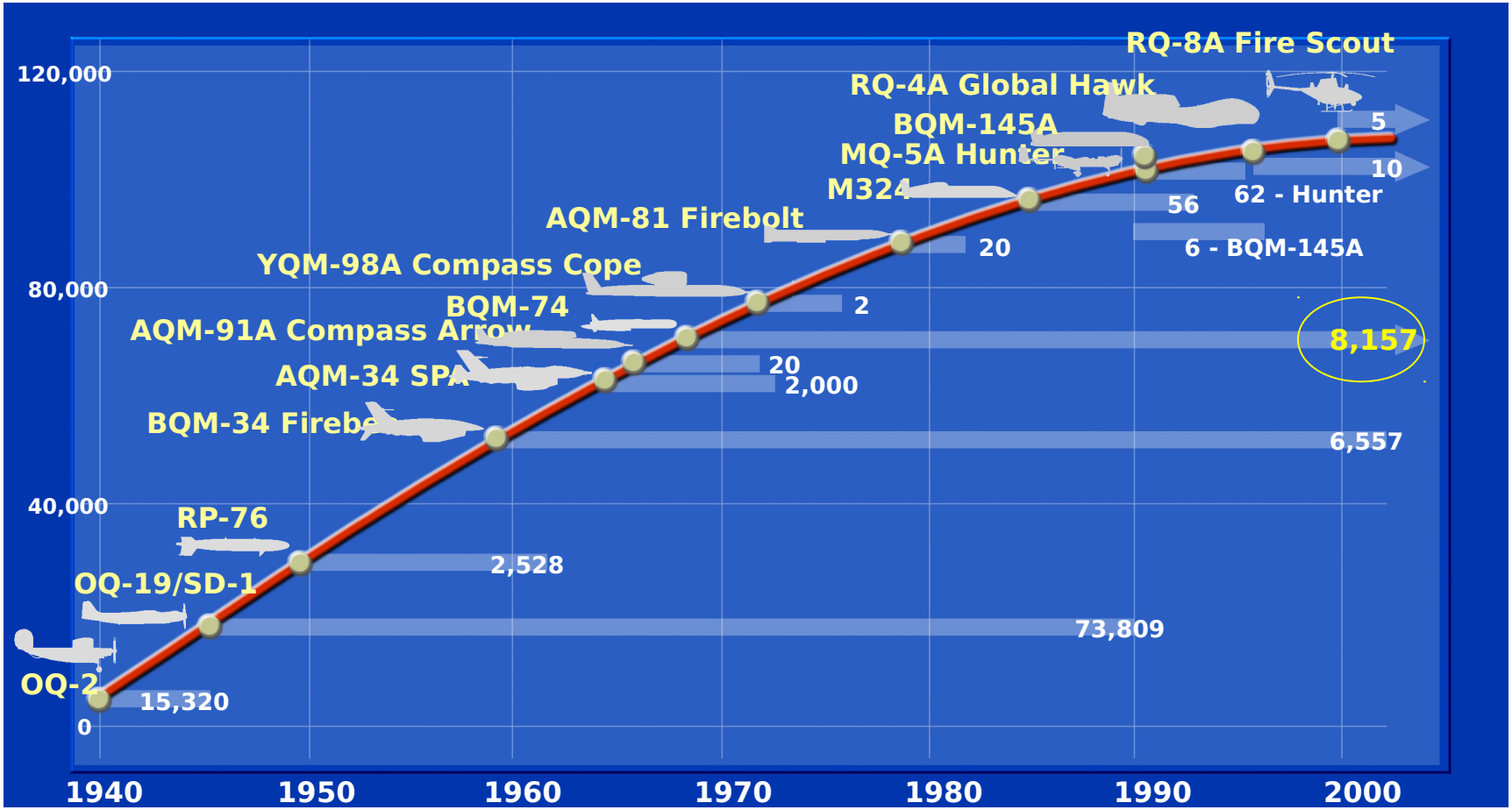
Northrop Grumman Unmanned Systems Heritage. . . Across All Mission Areas



>100,000 Unmanned Vehicles Delivered

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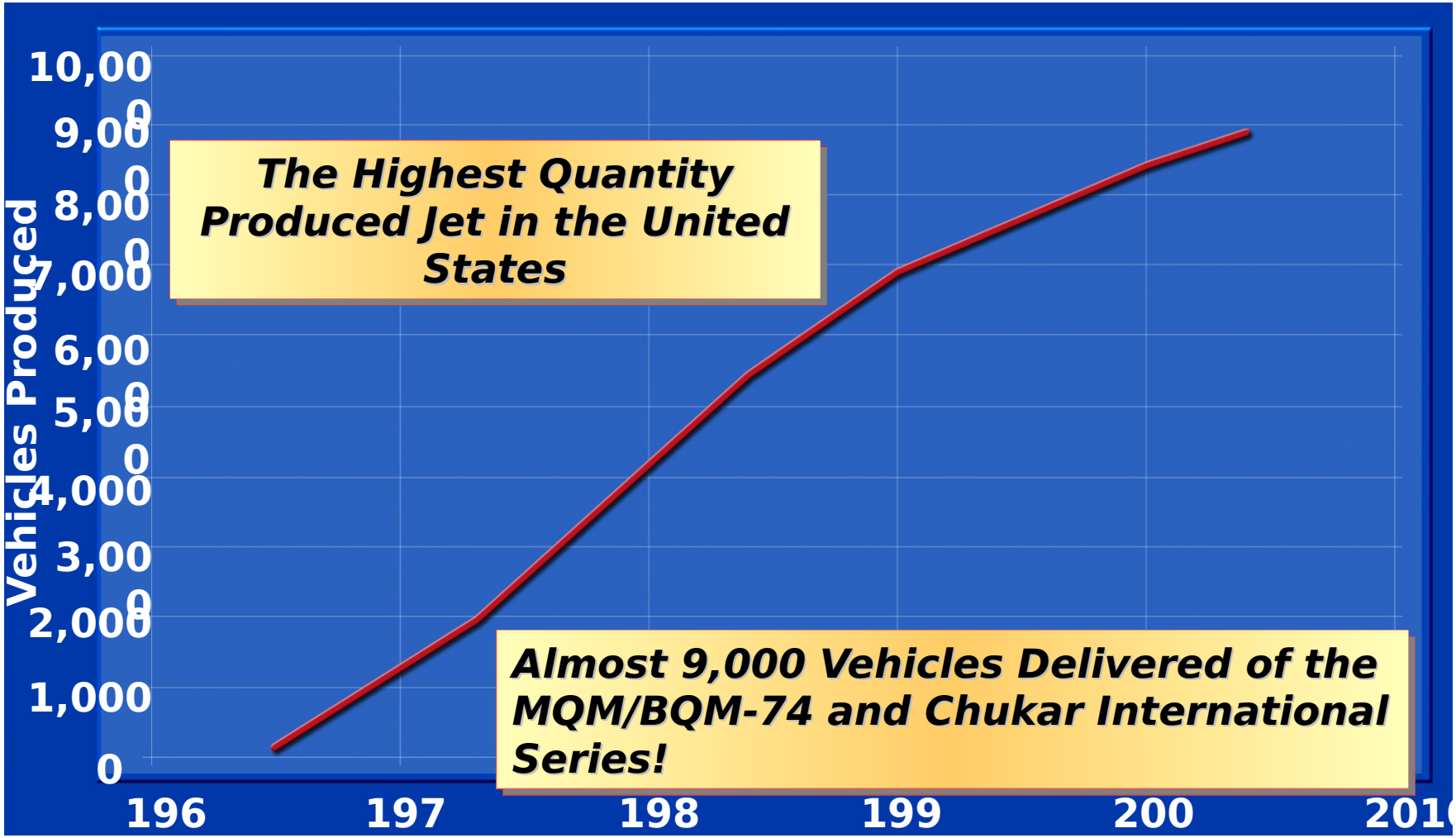
MQM/BQM-74 and Chukar Production



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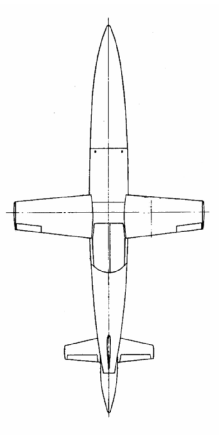
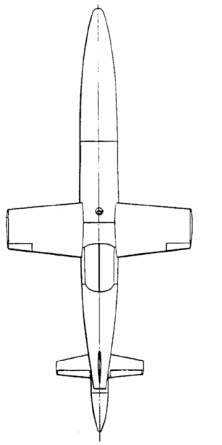
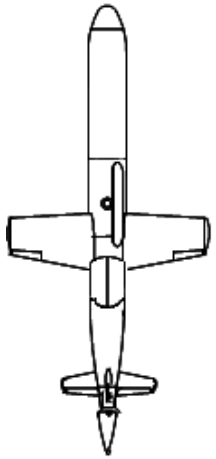
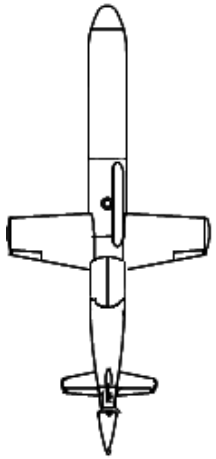
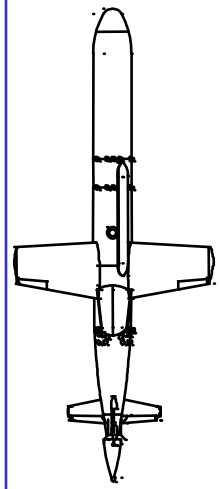
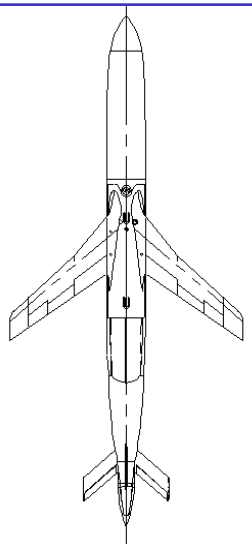
BQM-74F Evolution

MQM-74A 1966	MQM-74C 1973	BQM-74C 1980	BQM-74E 1991	BQM-74ER 1996	BQM-74F 2005
					
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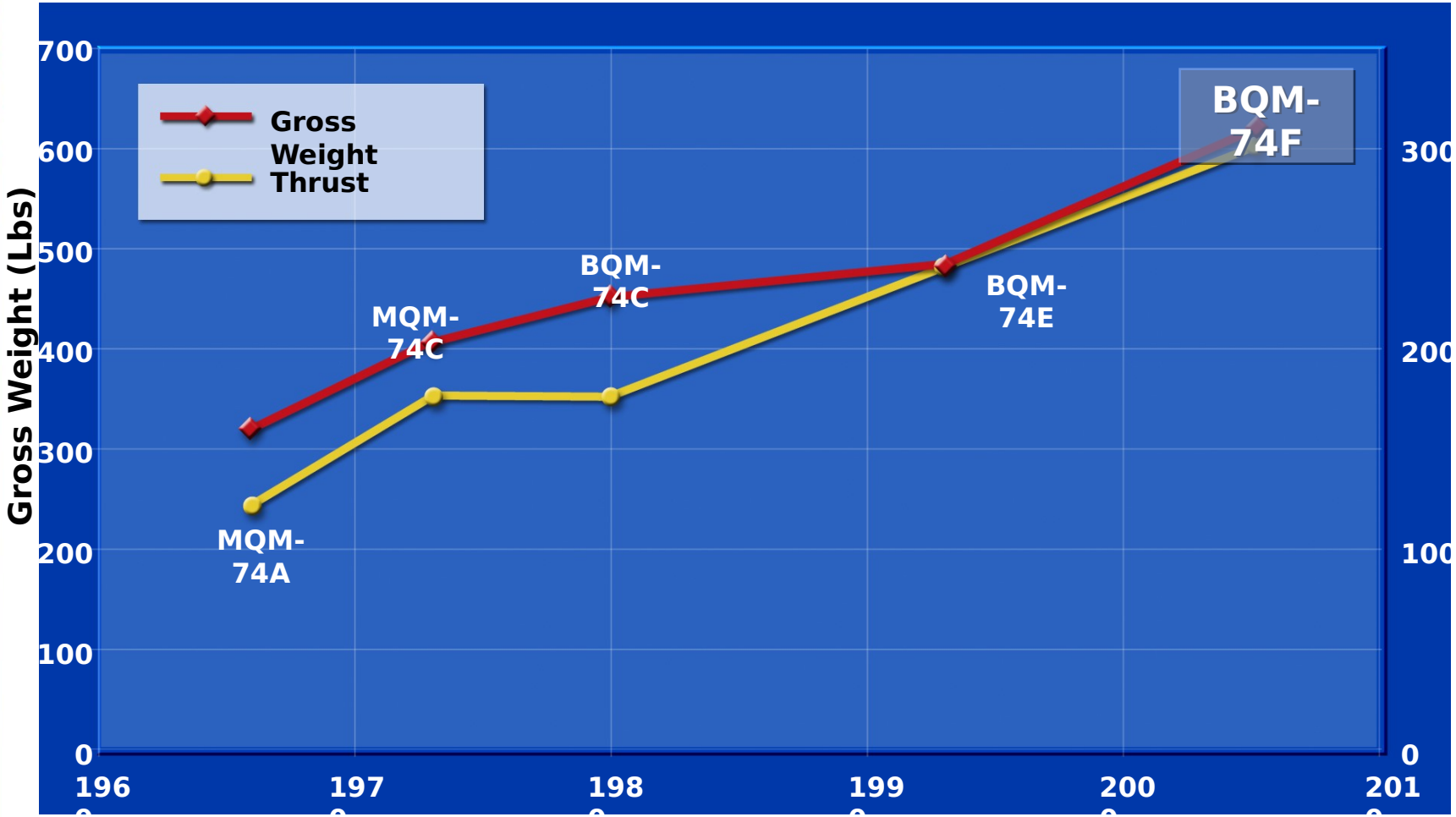
MQM/BQM-74 Growth to BQM-74F



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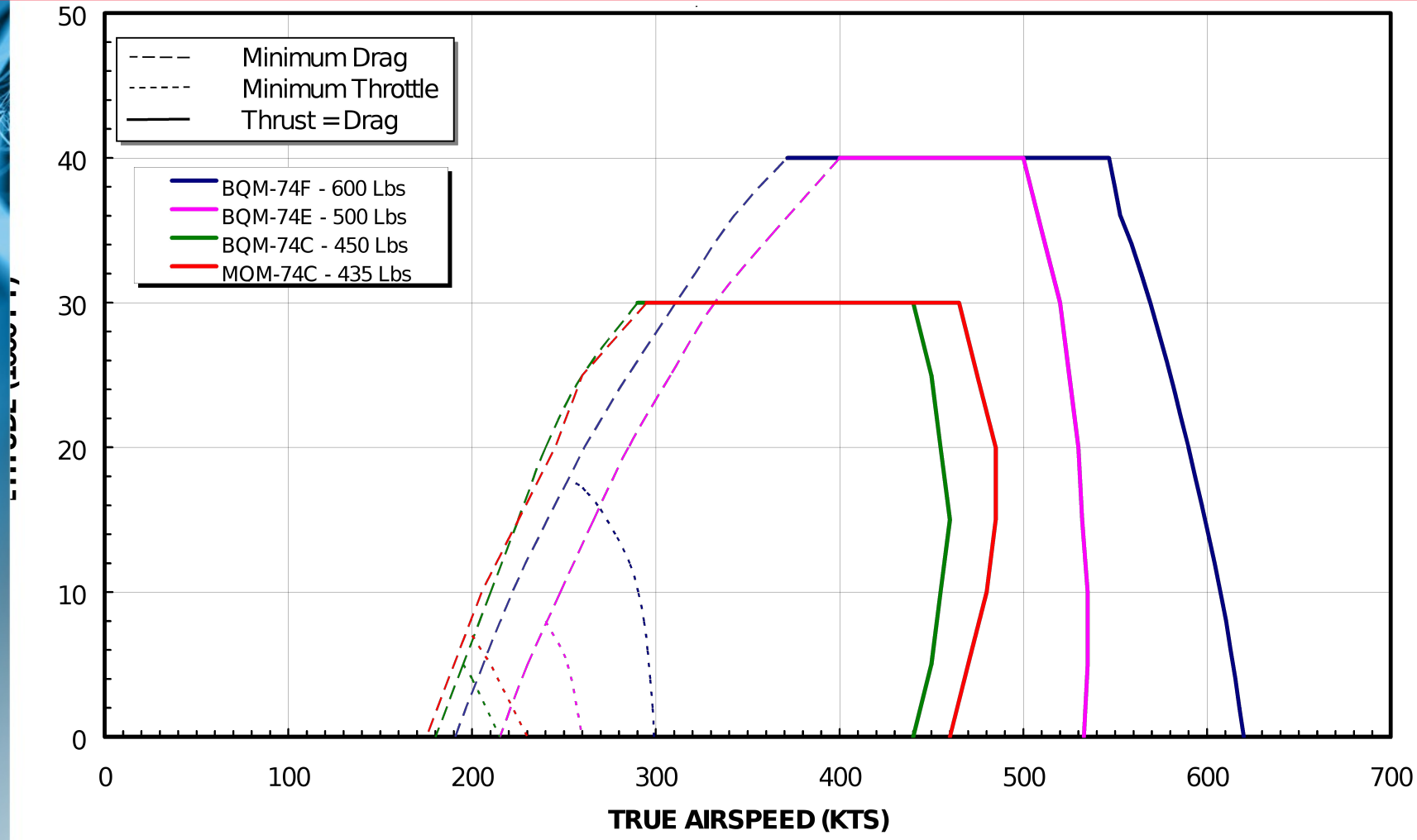
Speed-Altitude Envelopes



BQM-74F Provides Significant Increase in Performance

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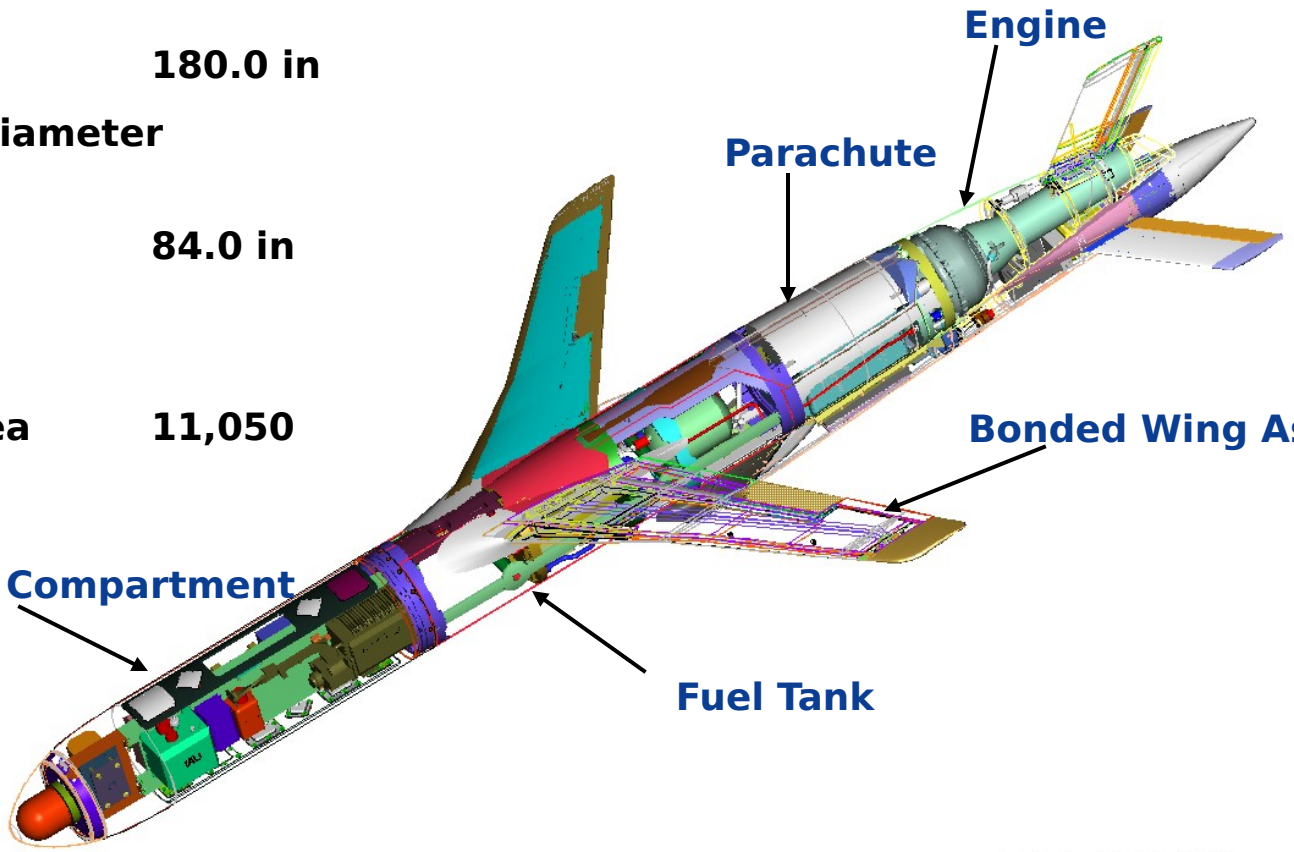
BQM-74F Cut Away View

Length	**180.0 in**
Fuselage Diameter	**14.0 in**
Wing Span	**84.0 in**
Wing Area	**8.0 ft²**
Wetted Area	**11,050 in²**



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BQM-74F Enhanced Aerial Target

- **BQM-74E Capability**
  - Low Altitude to 7’ ASL
  - Fixed and Programmable Weaves
  - Waypoint Navigation
- **Mission Planning**
- **Modernized Support Equipment (PC Based)**
- **Air Launch Capable**
- **Increased Speed, Range, Maneuvers, Payload Capability**

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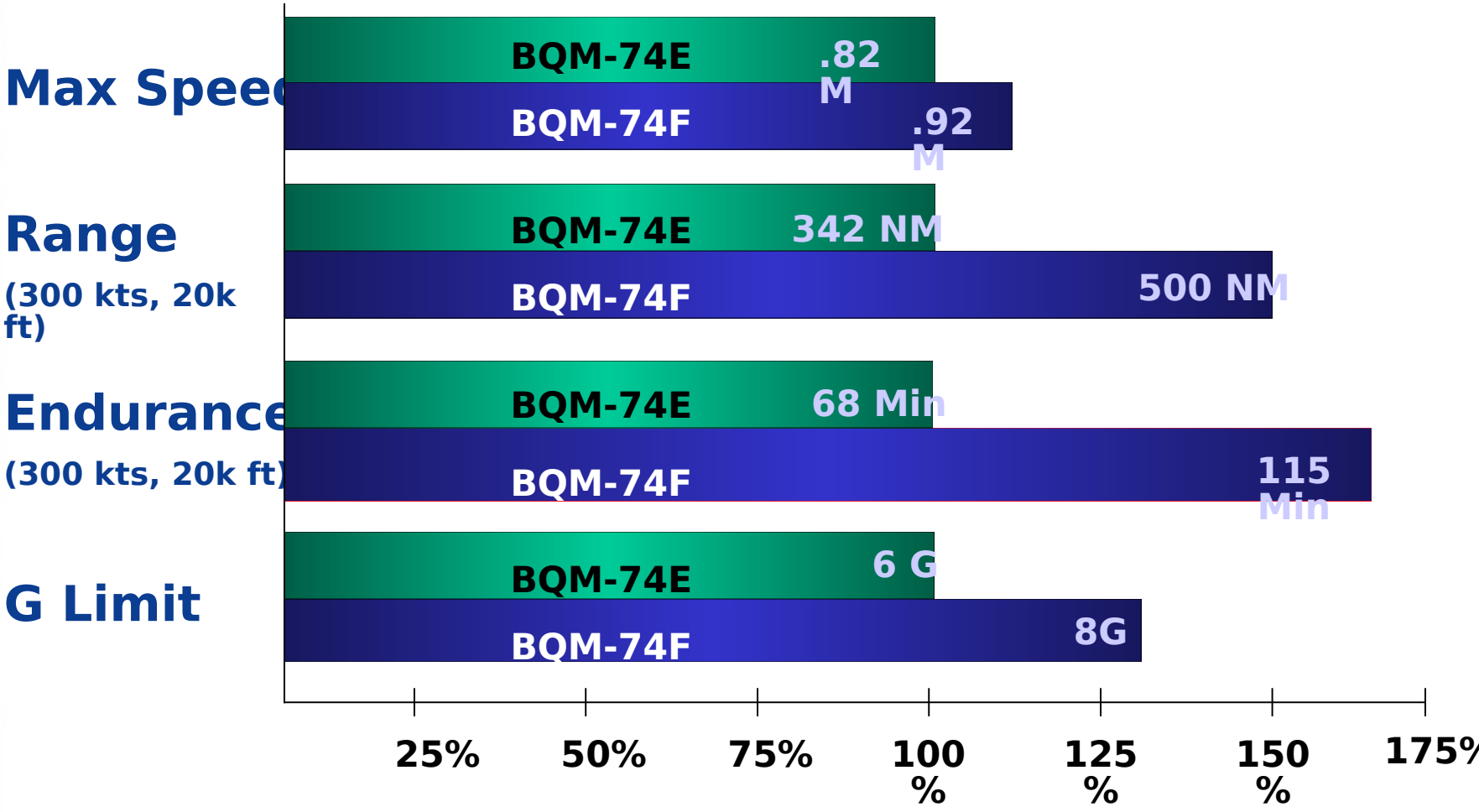
BQM-74F vs BQM-74E Requirements



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BQM-74F Technical Performance Metrics

Metric	Reqmt	Status
Maximum Speed @ 7 ft MSL	0.92 M	0.93 M
Minimum Speed @ 7 ft MSL	0.47 M	0.44 M
Range @ 20K ft MSL, Unconstrained Airspeed	500 nmi	589 nmi
Range @ 0.9M, 50 ft MSL	225 nmi	247 nmi
Endurance	115 min	120.6 min
Minimum Altitude	7 ft MSL	7 ft MSL
Gross Flight Weight, Configuration #8	620 lbs derived	625.4 pounds

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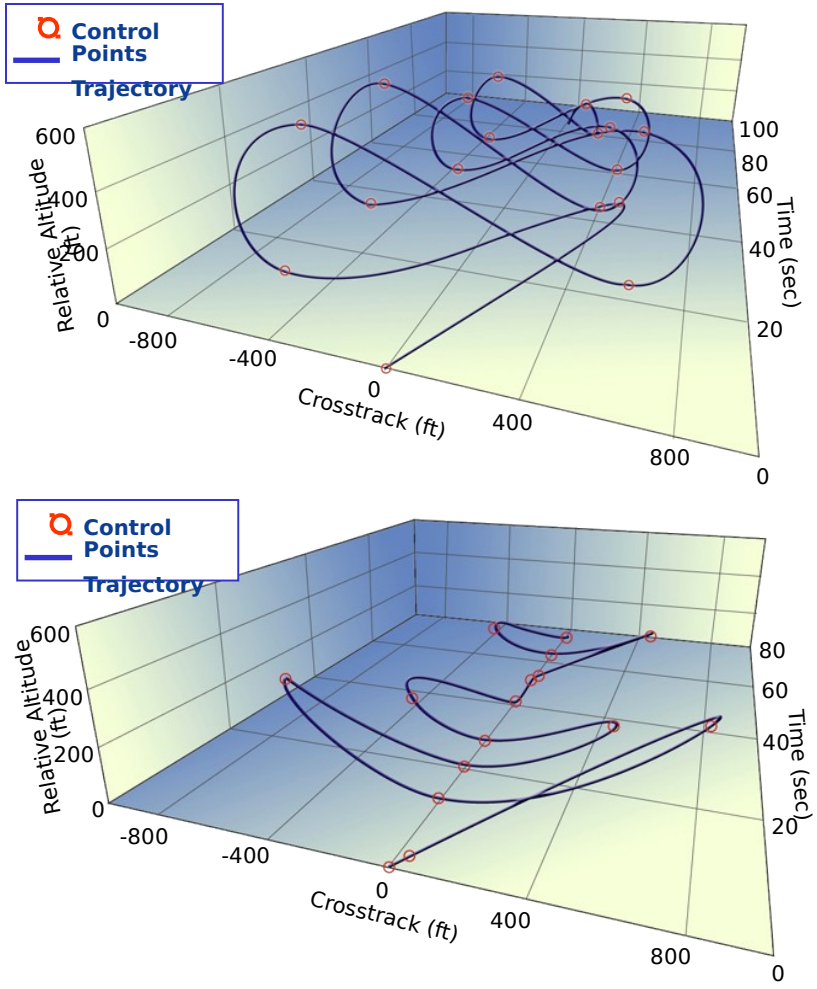
BQM-74F Weave Maneuvers

- Programmable High-G Maneuvers in 3D Space
- G-Levels Up to 6 Gs
- Cruise and Engagement Altitudes Down to 7 Feet
- Radar Altimeter with Inertial Aiding Allows Unlimited Roll Attitude
- User Defined Trajectories Using PC Based Weave Planner, Plus 5 Fixed Weave Maneuvers
- Downrange Defined Relative to Distance Traveled or Time from Engagement



The BQM-74F Accurately Replicates Threat Terminal Maneuvers

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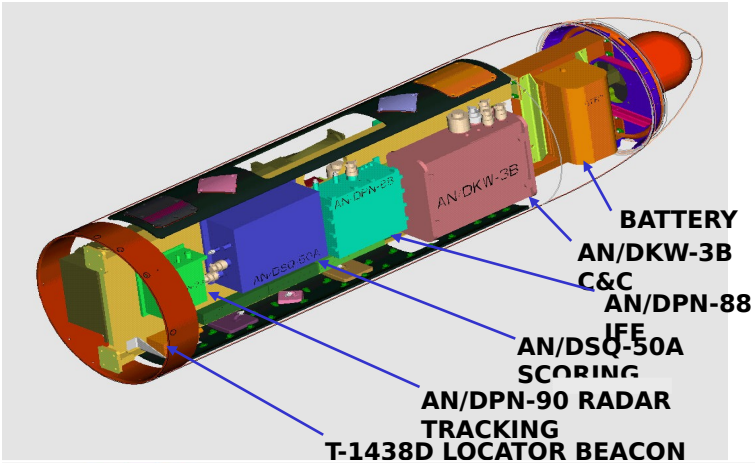
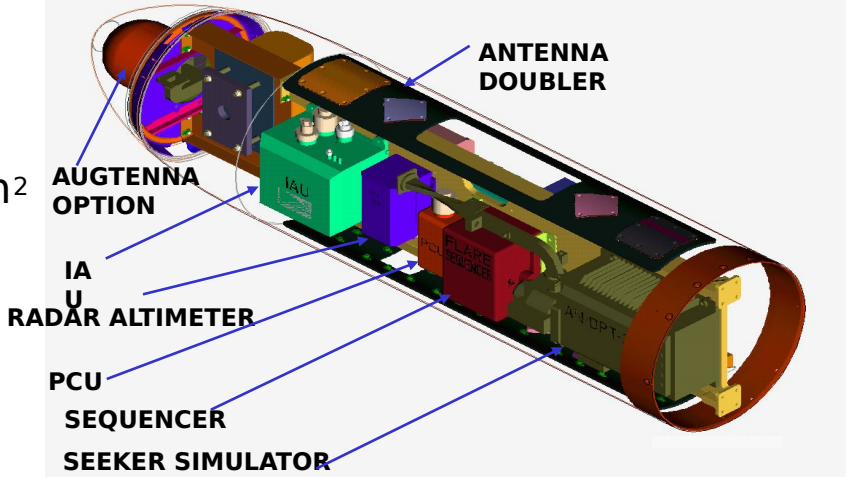
BQM-74F Mission Payload Capabilities

- **Power Capacity: 2,000 Watts**
- **Payload Volume/Weight: ~ 5 ft³/100lbs**
- **Command and Control Systems**
  - AN/DKW-3B(V), SNTC
- **Radar Altimeter: RT/1378**
- **Scalar Scoring: AN/DSQ-50A**
- **RCS Augmentation**
  - Passive @ 10GHz: 0.5,1.0 4.0 m^2 nose, 2.0 m^2 tail
  - Active: E,F,I,J Band Selectable 3.0, 5.0, 7.0, and 10.0 m^2
- **RCS Reduction @ 10GHz Nose-on**
  - -17, -14, -12, -10, -3 and 0 dbsm
- **IR Augmentation**
  - Flares, Plumers
- **Locator/ID Mission Equipment**
  - IFF AN/DPN-88
  - Range AN/DPN-90(V)
  - Recovery T-1438/D
- **Seeker Simulator: AN/DPT-2B**
- **ECM: ULQ-21 Suite**
- **Growth Capability in Payload Bay**





Rapidly Reconfigurable Payloads

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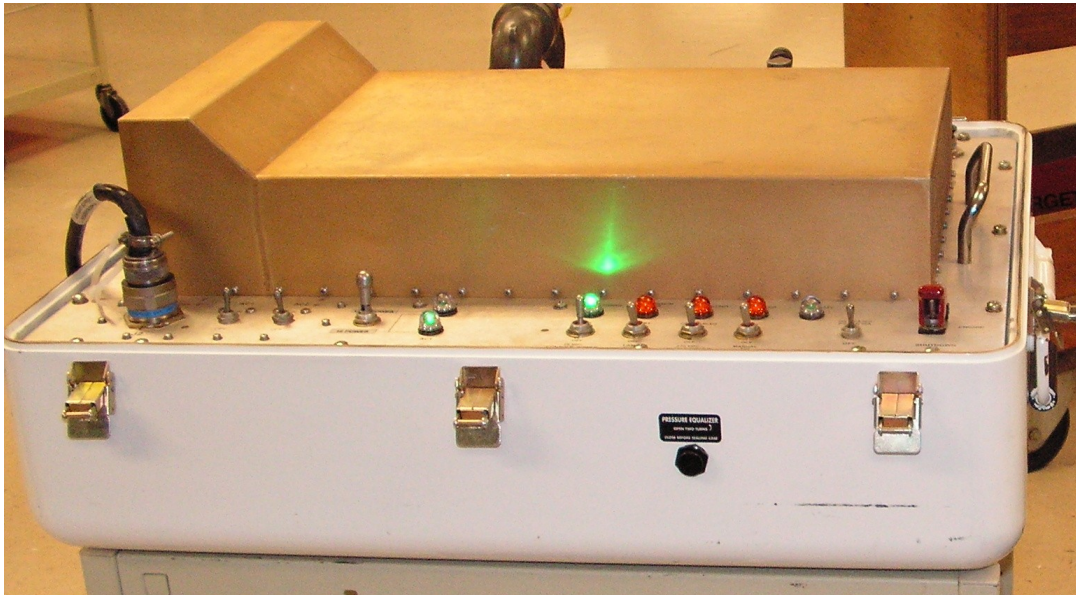
Modernized Support Equipment



Ground Support Power Supply (GSPS)

Computer Console

Integrated Test Set Provides User Friendly PC Based System Test Capability and Increased Ground Power for Payloads

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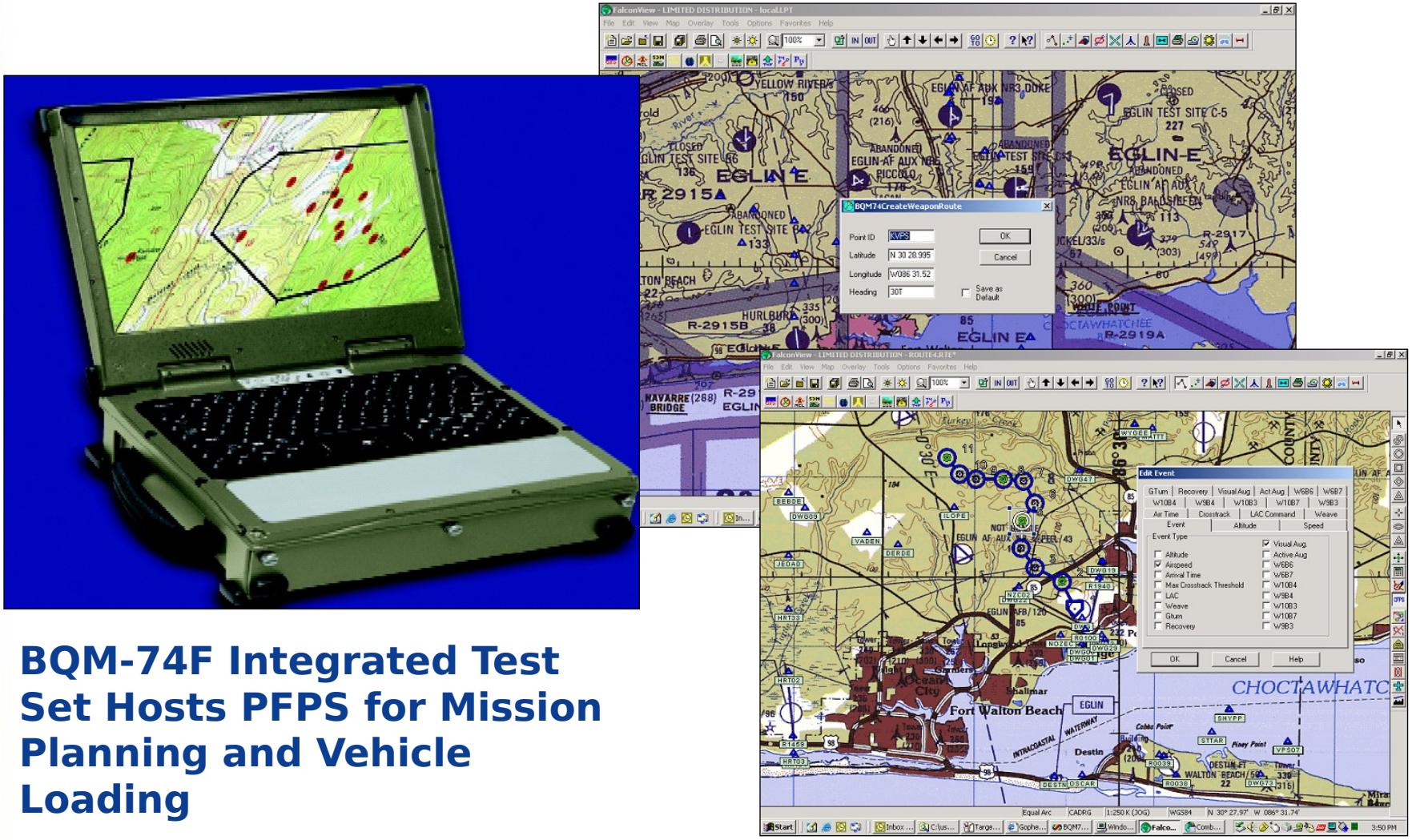
PFPS Mission Planning Toolset



BQM-74F Integrated Test Set Hosts PFPS for Mission Planning and Vehicle Loading

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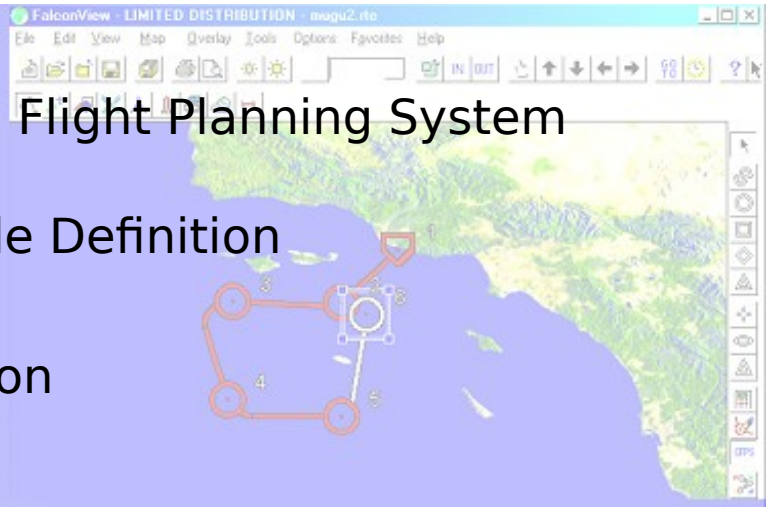
BQM-74F Mission Planning/Waypoint Nav

- **Mission Planning**
  - Integrated With USAF/USN Portable Flight Planning System (PFPS) Mission Planning Tool
  - Worldwide Route and Speed/Altitude Definition
  - Multiple Map Backgrounds
  - 6-DOF Simulation Mission Verification
  - Transfer to Autopilot via Umbilical
- **Waypoint Navigation**
  - Accurate, Repeatable, Flexible
  - Multiple Missions Selectable in Flight
  - Nudge and Rotate for In Flight Adjustment
  - Easy Transitions to and From Manual Control
  - Go To Waypoint Selectable Anytime in Flight
  - Based on Flight Demonstrated Chukar III and BQM-34 Firebee Capability



Portable Flight Planning System (PFPS) is BQM-74F Mission Planning System

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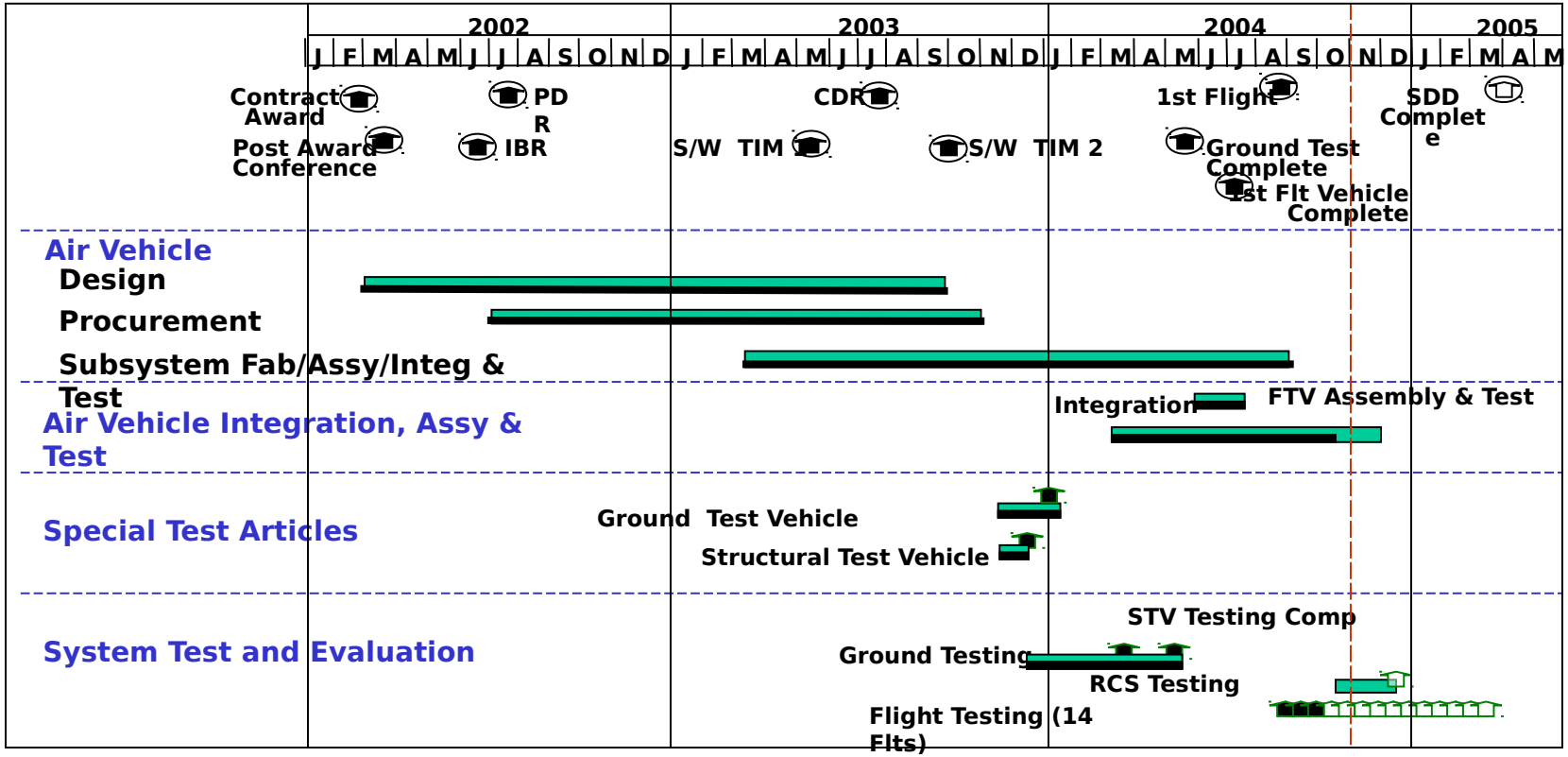
BQM-74F Summary Schedule



- **Detailed Design and Fabrication Complete**
- **Program In Test and Evaluation Phase**
  - Subsystem Testing Complete
  - System Test and Evaluation In-Process

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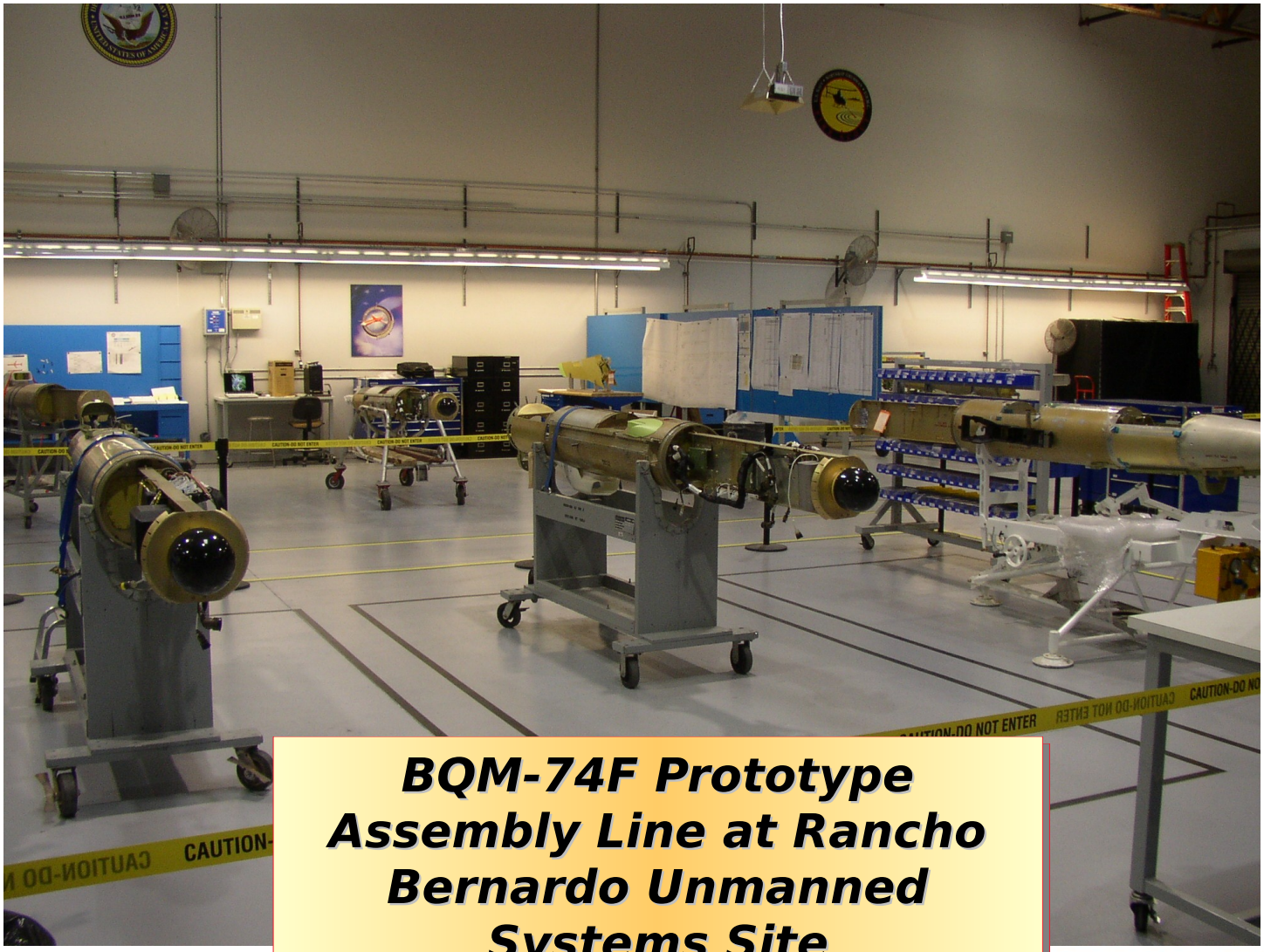
BQM-74F Air Vehicles in Assembly



BQM-74F Prototype Assembly Line at Rancho Bernardo Unmanned Systems Site

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First Unit Roll-out August 2005

BQM-74F
First New NAVAIR Subsonic Subscale Target in Over 20 Years

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BQM-74F
Integrated Product Team Members

NORTHROP GRUMMAN

Williams International

BAE SYSTEMS

SCHWEIZER

Aerospace Systems

Coast Precision

Crater Industries

Reyes Machining

Rozendal Associates

Senior Aerospace Composites

Sensor Systems

Solid Concepts

Viable Power Conversion

Performance Plastics

Mandaree

FXC/Guardian Parachute

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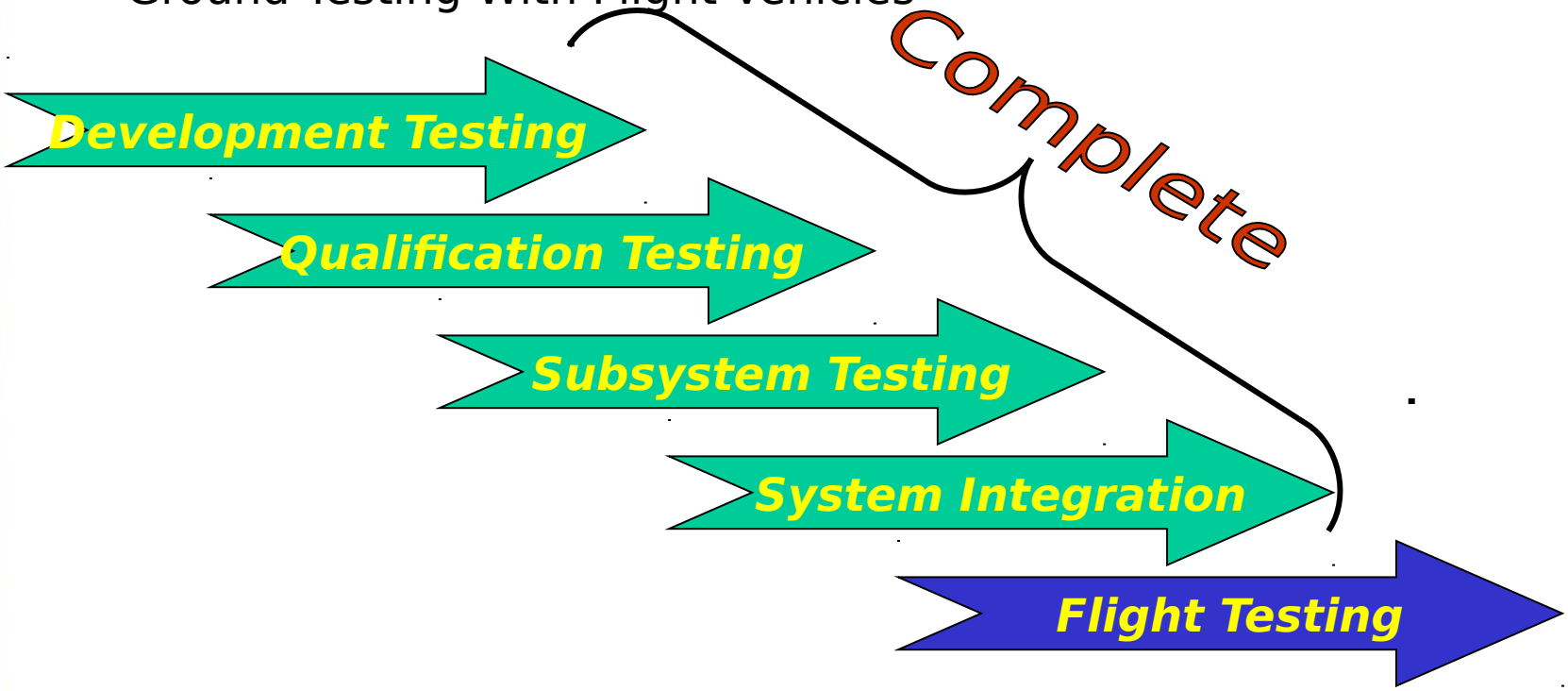
BQM-74F Test and Evaluation Approach

- **Comprehensive Ground Test Program**
- **Minimize Flight Risk**
- **Maximum Use of Assets**
  - Ground Testing With Flight Vehicles



Flight Test Risk Minimized With Comprehensive Ground Test Program

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BQM-74F Test and Evaluation Accomplishments

- **Component and Subsystem Qualification/Air Worthiness Tests Complete**
- **Subsystem Integration Testing Complete**
  - Propulsion
  - Recovery System
  - Control System
- **System Integration Complete**
- **Flotation and Helicopter Retrieval Complete**
- **HERO Testing Complete**
- **Flight Testing Underway**

Ground Test Vehicle in HERO Test at China Lake

Ground Test Vehicle in Flotation Test

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Subsystem Qualification - Airframe

- **Airframe - Structural Static and Dynamic Tests Complete**
- **Air Vehicle Modal Survey/Flutter Correlation Complete**

Structural Test Vehicle Instrumented for Modal Survey

Structural Test Vehicle Under Tes

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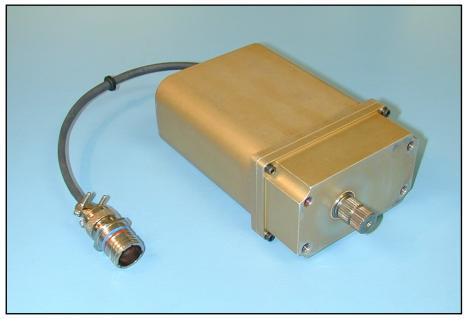
Avionics Qualification

- **Qualification/Airworthiness Tests (AWT) Complete**
  - Power System
  - Vehicle Management Computer
    - In BQM-74E Production
  - Actuators (AWT)

Controller Voltage Regulator (Viable)



Rotary Actuator Ailerons and Elevator (NG UMS)

Linear Actuator Rudder (NG UMS)

Integrated Avionics (BAE)

BQM-74F Avionics Flight Qualified

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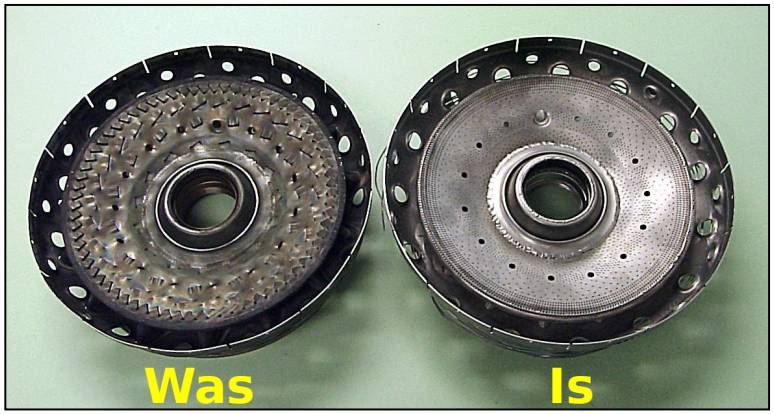
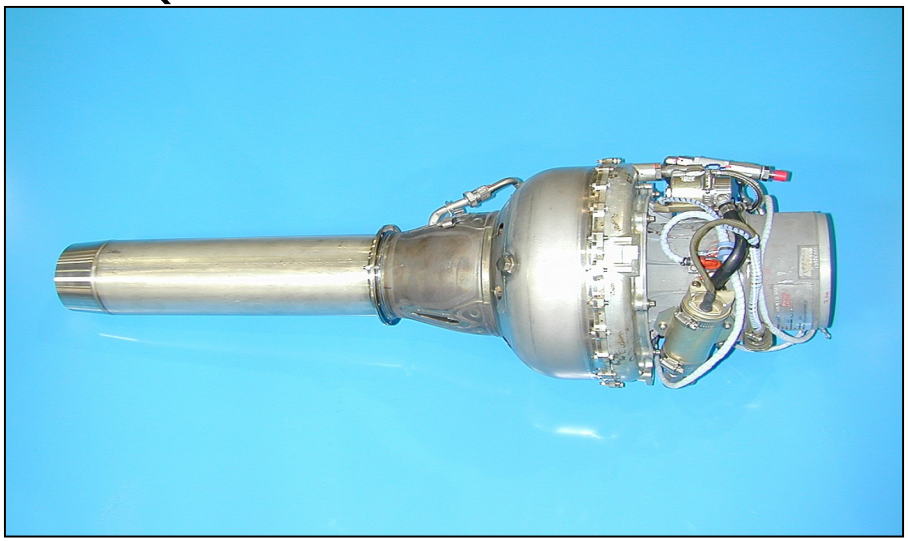
Propulsion Qualification
J400-WR-405 Jet Engine (Williams)

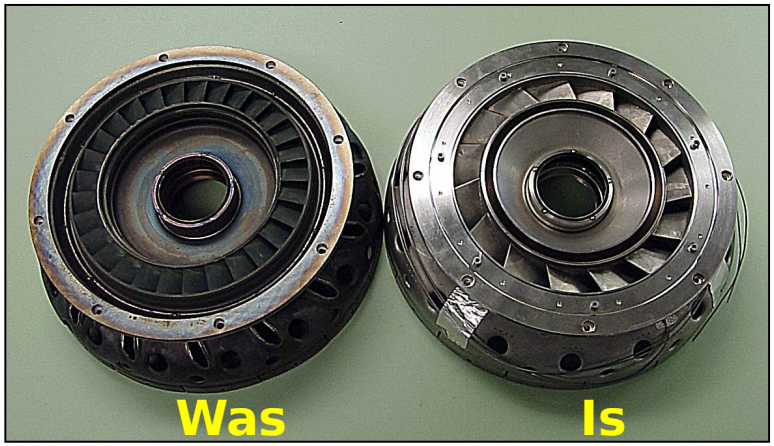
- **Burner Development and Qualification Complete**
  - Highly Accelerated Life Test (HALT)
  - 30 Hour Endurance Test
  - BQM-74E Air Launch Start



Louvered Cooling to Effusion



Delivered 300 lb Thrust Engine



Solid to Cooled Nozzle Va

J400-WR-405 Engine Service Life and Performance Demonstrated

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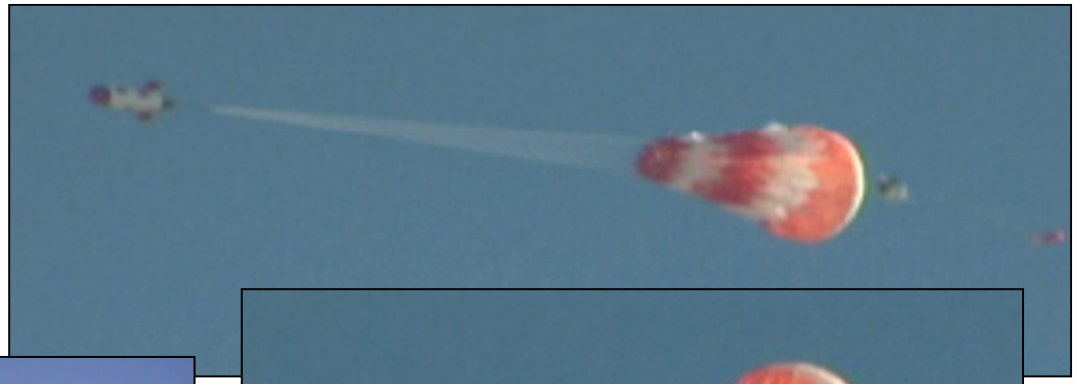
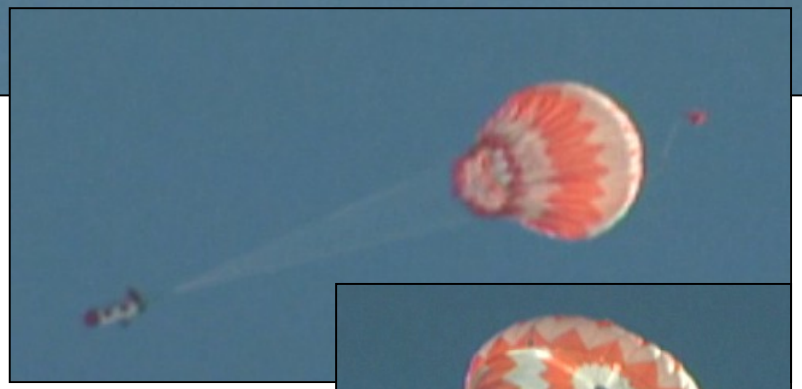
Subsystem Qualification
Parachute (Guardian/FXC)

Deployment Bag Pull Tests





MIG-15 High Speed Test Platform

Drop Test Vehicle

Deployment Bag System Meets Requirements for Vehicle Loads, Weight and Descent Rate

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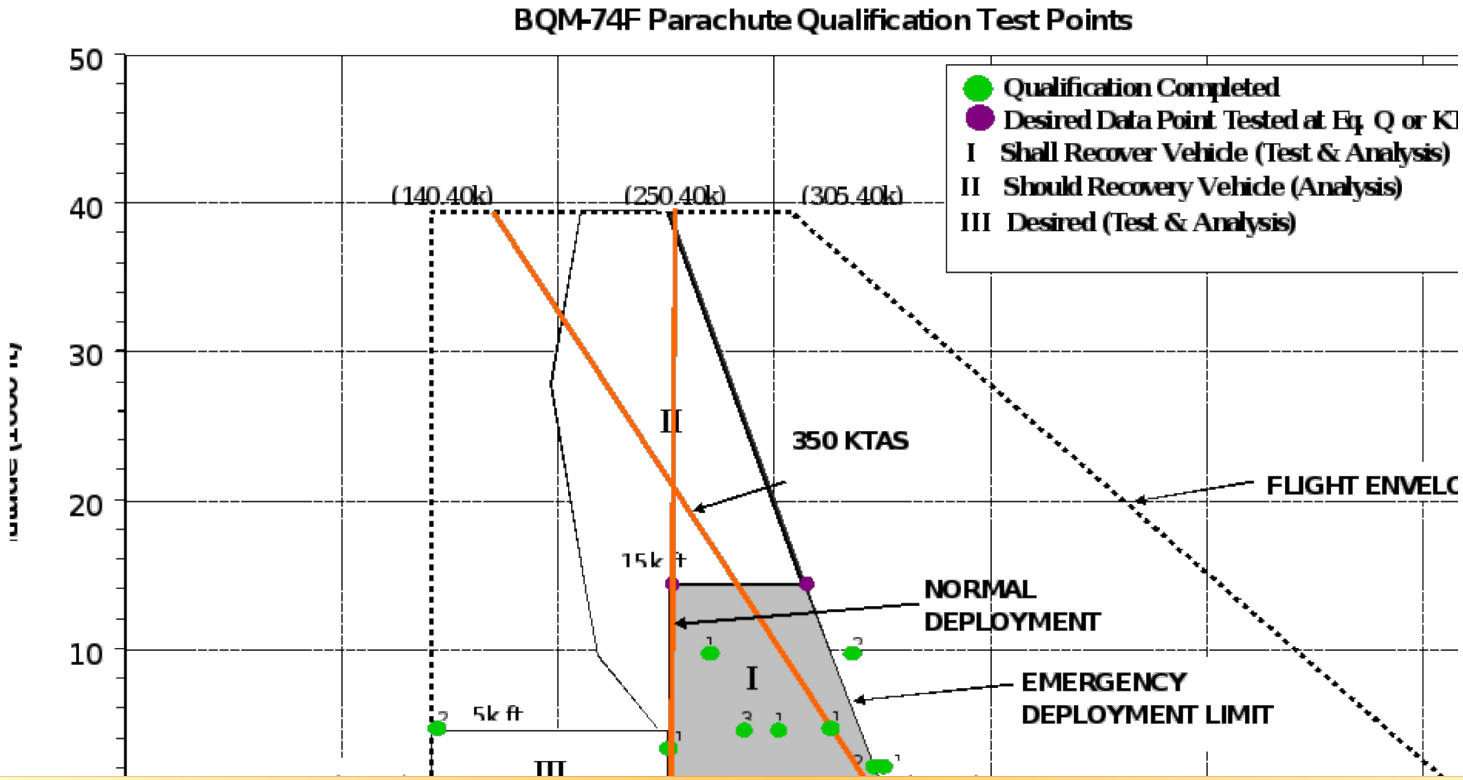
Subsystem Qualification
Parachute (Guardian/FXC)

- **Recovery System – Qualification Complete**
  - **Deployment Bag Parachute System Tested Over Full Deployment Envelope**



Parachute System Meets Envelope Requirements

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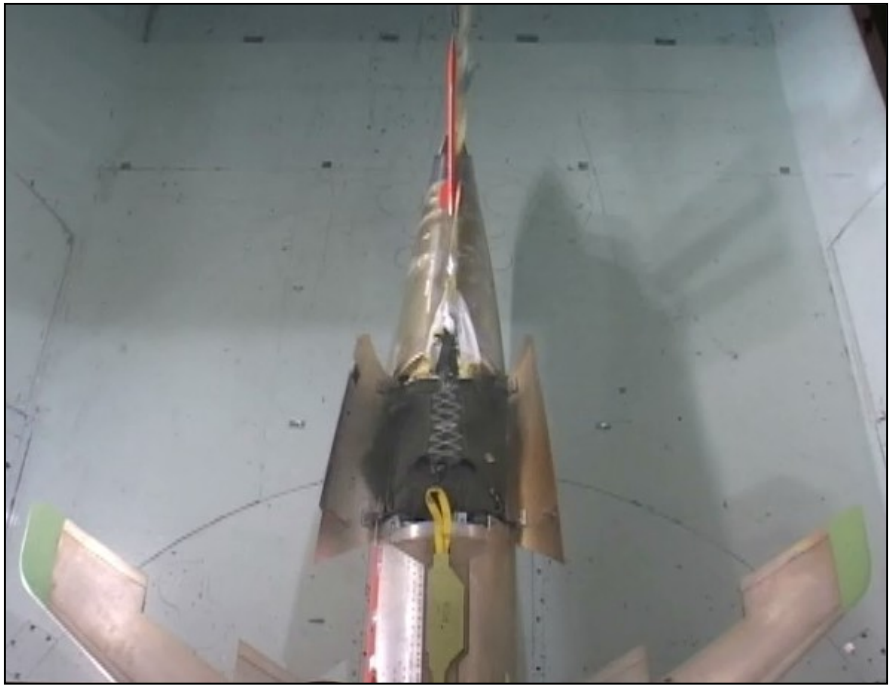
Subsystem Integration Testing Recovery System

- **Recovery System Tested in High Speed Wind Tunnel (Allied Aerospace)**
  - Complete Airframe
  - Parachute System
  - Parachute Release Mechanism
- **Demonstrated Successful Deployment in Ground Test Environment**
- **Documented Release Mechanism/Door Operational Loads**



Parachute Extraction in HSWT

Recovery System Operation Proven in Ground Testing

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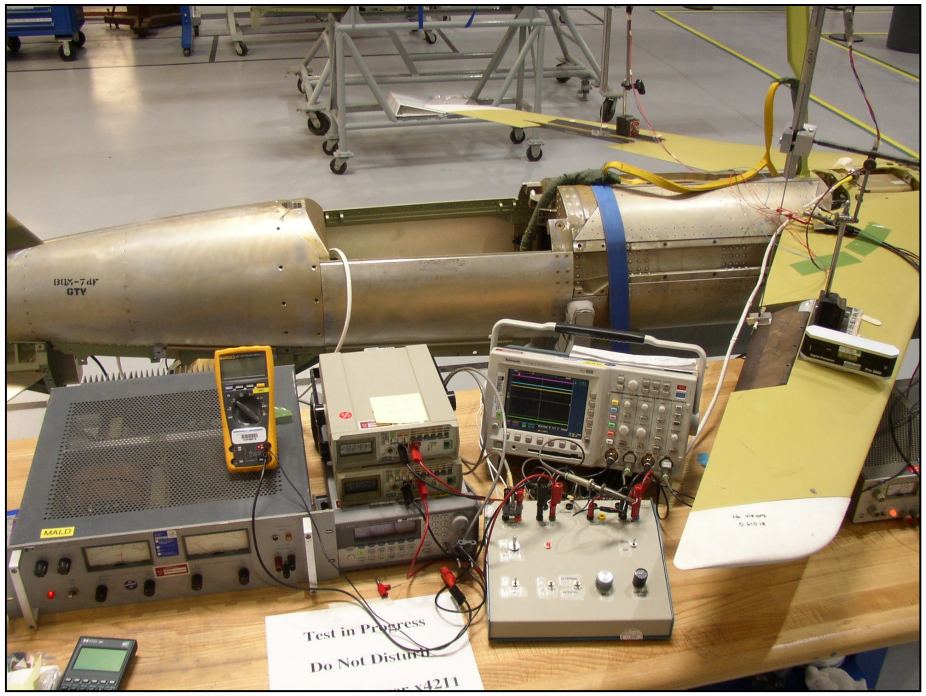
Subsystem Testing
Controls

- **All 3 Axis Tested for Free Play and Stiffness Using Full Flight Vehicle Control System**
  - Elevator w/ Actuator
  - Aileron w/ Actuator
  - Rudder w/ Actuator
- **Identified Design Improvements Incorporated Into Vehicle**
- **Overall Performance Validated in 6-DOF Simulation**



Control System Testing in Air Vehi

Extensive Ground Test Validated Control System Performance

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Propulsion Integration

- Propulsion Integration Conducted at Local Airport
  - Fuel System and Electrical Checks
  - Engine Start and Run
  - Visual Augmentation Checks
  - Support Equipment (Integrated Test Set)

Successful Engine Integration Testing

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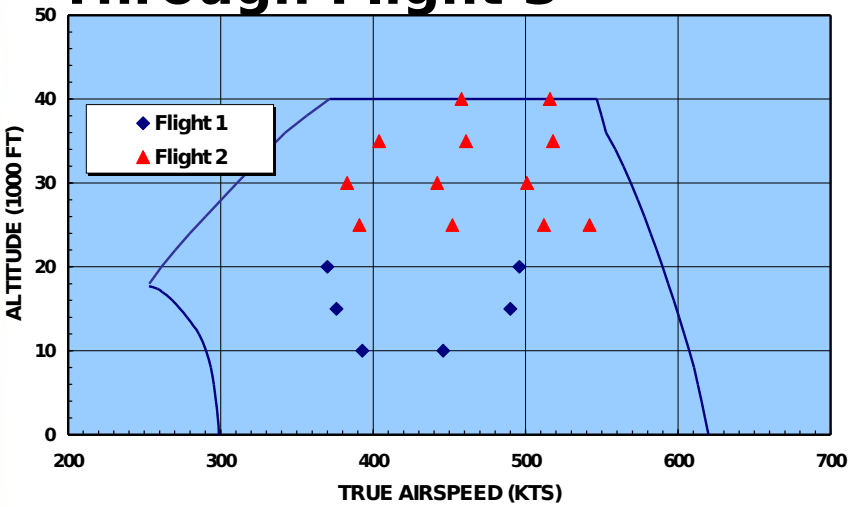
BQM-74F Flight Testing

- **First Flight Successfully Conducted on 29 August**
- **Five Successful Launches and Recoveries to Date**
  - Flights 1
  - Flights 2A Through 2C
  - Flight 3
- **All Flight Objectives Met Through Flight 3**



Flight Test Envelope Points

Launch

Retrieval

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Planning the Future

- SDD Program Prepared for Production
  - Suppliers Selected
  - Production Tooling and Test Equipment Completed
  - Component/ Subsystem Qualification Completed
  - First Article Inspections Completed
- Production Site Selected
- Production Planned for FY06

Sierra Vista, AZ Site Ready for BQM-74F Production

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BQM-74F

Target for Tomorrow
Built from the Success of the Past

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